

SN 10/715,806  
Docket No. S-100,641  
In Response to Office Action dated December 19, 2005

#### AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

#### LISTING OF CLAIMS:

Claim 1. (currently amended) A process for preparing a solid composite including colloidal nanocrystals dispersed within a sol-gel host, the process consisting essentially of comprising:

forming an admixture of colloidal nanocrystals, a lower alcohol, a non-polar co-solvent and a sol-gel precursor material; and,

forming said solid composite from said admixture.

Claim 2. (original) The process of claim 1 wherein said colloidal nanocrystals have a volume loading of up to about 30 percent by volume within said solid composite.

Claim 3. (original) The process of claim 1 wherein said non-polar co-solvent is selected from the group consisting of tetrahydrofuran, toluene and xylene.

Claim 4. (original) The process of claim 1 wherein said lower alcohol is a C<sub>1</sub> to C<sub>4</sub> alcohol.

Claim 5. (original) The process of claim 1 wherein said sol-gel precursor material is selected from the group consisting of metal alkoxide compounds, metal halide compounds, and metal hydroxide compounds where the metal is selected from the group consisting of silicon, titanium, zirconium, aluminum, vanadium, iron, tin, tantalum, cerium, and chromium.

Claim 6. (original) The process of claim 1 wherein said colloidal nanocrystals are selected from the group consisting of M<sub>1</sub>X<sub>1</sub>, M<sub>1</sub>M<sub>2</sub>X<sub>1</sub>, M<sub>1</sub>M<sub>2</sub>M<sub>3</sub>X<sub>1</sub>, M<sub>1</sub>X<sub>1</sub>X<sub>2</sub>, M<sub>1</sub>M<sub>2</sub>X<sub>1</sub>X<sub>2</sub>, M<sub>1</sub>M<sub>2</sub>M<sub>3</sub>X<sub>1</sub>X<sub>2</sub>, M<sub>1</sub>X<sub>1</sub>X<sub>2</sub>X<sub>3</sub>, M<sub>1</sub>M<sub>2</sub>X<sub>1</sub>X<sub>2</sub>X<sub>3</sub>, and M<sub>1</sub>M<sub>2</sub>M<sub>3</sub>X<sub>1</sub>X<sub>2</sub>X<sub>3</sub>, where M<sub>1</sub>, M<sub>2</sub>, and M<sub>3</sub> are each selected from the group consisting of Zn, Cd, Hg, Al, Ga, In, Tl, Pb, Sn, Mg, Ca, Sr, Ba, mixtures and alloys thereof and X<sub>1</sub>, X<sub>2</sub>, and X<sub>3</sub> are each selected from the group consisting of S, Se, Te, As, Sb, N, P, mixtures and alloys thereof, Si, Ge, Au, Ag, Co, Fe, Ni, Cu, Mn and alloys of Au, Ag, Co, Fe, Ni, Cu, Mn or alloy combinations thereof.

Claim 7. (original) The process of claim 1 wherein said sol-gel host is transparent.

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Claim 8. (original) The process of claim 1 wherein said colloidal nanocrystals are uniformly dispersed within a sol-gel host.

Claim 9. (withdrawn) A process for preparing a solid composite including colloidal nanocrystals dispersed within a sol-gel host matrix, the process comprising:

reacting colloidal nanocrystals passivated with hydrophobic ligands with a multi-functional compound of the formula  $X_x(Z_n)-Y_y$  where X is an amino group, a thiol group, a phosphonic acid group, a phosphine oxide group, a nitrile group, a thiocyanate group, or a carboxylic acid group, x is an integer and is one or more, Z is a hydrocarbon group, a polyether group, an ethylene oxide group, a propylene oxide group or a mixture thereof, n is from 1 to 20, Y is a hydroxyl group, a carboxylic acid group, a sulfonic acid group, a phosphonic acid group, or an alkoxysilane group and y is an integer and is one or more, within a solvent to form a homogeneous colloidal nanocrystal solution including colloidal nanocrystals with at least a portion of hydroxyl-terminated, carboxylic acid-terminated groups, sulfonic acid-terminated groups, phosphonic acid-terminated groups or alkoxysilane-terminated groups thereon;

admixing the homogeneous colloidal nanocrystal solution and a sol-gel precursor material; and,

forming said solid composite from said admixture.

Claim 10. (withdrawn) The process of claim 9 wherein said colloidal nanocrystals have a volume loading of up to about 30 percent by volume within said solid state composite.

Claim 11. (withdrawn) The process of claim 9 wherein said sol-gel precursor material is selected from the group consisting of metal alkoxide compounds, metal halide compounds, and metal hydroxide compounds where the metal is selected from the group consisting of silicon, titanium, zirconium, aluminum, vanadium, iron, tin, tantalum, cerium, and chromium.

Claim 12. (withdrawn) The process of claim 9 wherein said colloidal nanocrystals are selected from the group consisting of  $M_1X_1$ ,  $M_1M_2X_1$ ,  $M_1M_2M_3X_1$ ,  $M_1X_1X_2$ ,  $M_1M_2X_1X_2$ ,  $M_1M_2M_3X_1X_2$ ,  $M_1X_1X_2X_3$ ,  $M_1M_2X_1X_2X_3$ , and  $M_1M_2M_3X_1X_2X_3$ , where  $M_1$ ,  $M_2$ , and  $M_3$  are each selected from the group consisting of Zn, Cd, Hg, Al, Ga, In, Tl, Pb, Sn, Mg, Ca, Sr, Ba, mixtures and alloys thereof and  $X_1$ ,  $X_2$ , and  $X_3$  are each

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selected from the group consisting of S, Se, Te, As, Sb, N, P, mixtures and alloys thereof, Si, Ge, Au, Ag, Co, Fe, Ni, Cu, Mn and alloys of Au, Ag, Co, Fe, Ni, Cu, Mn or alloy combinations thereof.

Claim 13. (withdrawn) The process of claim 9 wherein said sol-gel host is transparent.

Claim 14. (withdrawn) The process of claim 9 wherein said colloidal nanocrystals are uniformly dispersed within a sol-gel host.

Claim 15. (withdrawn) Alcohol-soluble colloidal nanocrystals comprising: a reaction product of colloidal nanocrystals and a multi-functional compound of the formula  $X_x-(Z_n)-Y_y$  where X is an amino group, a thiol group, a phosphonic acid group, a phosphine oxide group, a nitrile group, a thiocyanate group, or a carboxylic acid group, x is an integer and is one or more, Z is a hydrocarbon group, a polyether group, an ethylene oxide group, a propylene oxide group or a mixture thereof, n is from 1 to 20, Y is a hydroxyl group, a carboxylic acid group, a sulfonic acid group, a phosphonic acid group, or an alkoxy silane group and y is an integer and is one or more.

Claim 16. (withdrawn) The alcohol-soluble colloidal nanocrystals of claim 15 wherein said colloidal nanocrystals are overcoated with said multi-functional compound of the formula  $X_x-(Z_n)-Y_y$  including functionalities selected from the group consisting of amino-hydroxyl, thiol-hydroxyl, phosphonic acid-hydroxyl, and amino-carboxylic acid.

Claim 17. (withdrawn) The alcohol-soluble colloidal nanocrystals of claim 15 wherein said colloidal nanocrystals are overcoated with multi-functional molecules including amino-hydroxyl functionalities.

Claim 18. (withdrawn) The alcohol-soluble colloidal nanocrystals of claim 15 wherein said colloidal nanocrystals are selected from the group consisting of  $M_1X_1$ ,  $M_1M_2X_1$ ,  $M_1M_2M_3X_1$ ,  $M_1X_1X_2$ ,  $M_1M_2X_1X_2$ ,  $M_1M_2M_3X_1X_2$ ,  $M_1X_1X_2X_3$ ,  $M_1M_2X_1X_2X_3$ , and  $M_1M_2M_3X_1X_2X_3$ , where  $M_1$ ,  $M_2$ , and  $M_3$  are each selected from the group consisting of Zn, Cd, Hg, Al, Ga, In, Tl, Pb, Sn, Mg, Ca, Sr, Ba, mixtures and alloys thereof and  $X_1$ ,  $X_2$ , and  $X_3$  are each selected from the group consisting of S, Se, Te, As, Sb, N, P, mixtures and alloys thereof, Si, Ge, Au, Ag, Co, Fe, Ni, Cu, Mn and alloys of Au, Ag, Co, Fe, Ni, Cu, Mn or alloy combinations thereof.

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Claim 19. (currently amended) A solid composite comprising the reaction product of (i) colloidal nanocrystals including at least a portion of ~~hydroxyl-terminated groups, carboxylic acid-terminated groups, sulfonic acid-terminated groups, phosphonic acid-terminated groups, or~~ alkoxy silane-terminated groups thereon and (ii) a sol-gel precursor material.

Claim 20. (original) The solid composite of claim 19 wherein said colloidal nanocrystals have a volume loading of up to about 30 percent by volume within said solid composite.

Claim 21. (original) The solid composite of claim 19 wherein said sol-gel precursor material is selected from the group consisting of metal alkoxide compounds, metal halide compounds, and metal hydroxide compounds where the metal is selected from the group consisting of silicon, titanium, zirconium, aluminum, vanadium, iron, tin, tantalum, cerium, and chromium.

Claim 22. (original) The solid composite of claim 19 wherein said colloidal nanocrystals are selected from the group consisting of  $M_1X_1$ ,  $M_1M_2X_1$ ,  $M_1M_2M_3X_1$ ,  $M_1X_1X_2$ ,  $M_1M_2X_1X_2$ ,  $M_1M_2M_3X_1X_2$ ,  $M_1X_1X_2X_3$ ,  $M_1M_2X_1X_2X_3$ , and  $M_1M_2M_3X_1X_2X_3$ , where  $M_1$ ,  $M_2$ , and  $M_3$  are each selected from the group consisting of Zn, Cd, Hg, Al, Ga, In, Tl, Pb, Sn, Mg, Ca, Sr, Ba, mixtures and alloys thereof and  $X_1$ ,  $X_2$ , and  $X_3$  are each selected from the group consisting of S, Se, Te, As, Sb, N, P, mixtures and alloys thereof, Si, Ge, Au, Ag, Co, Fe, Ni, Cu, Mn and alloys of Au, Ag, Co, Fe, Ni, Cu, Mn or alloy combinations thereof.

Claim 23. (original) A solid composite formed by the process of claim 1.

Claim 24. (original) The solid composite of claim 23 wherein said colloidal nanocrystals have a volume loading of up to about 30 percent by volume within said solid composite.

Claim 25. (original) The solid composite of claim 23 wherein said sol-gel precursor material is selected from the group consisting of metal alkoxide compounds, metal halide compounds, and metal hydroxide compounds where the metal is selected from the group consisting of silicon, titanium, zirconium, aluminum, vanadium, iron, tin, tantalum, cerium, and chromium.

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Claim 26. (original) The solid composite of claim 23 wherein said colloidal nanocrystals are selected from the group consisting of  $M_1X_1$ ,  $M_1M_2X_1$ ,  $M_1M_2M_3X_1$ ,  $M_1X_1X_2$ ,  $M_1M_2X_1X_2$ ,  $M_1M_2M_3X_1X_2$ ,  $M_1X_1X_2X_3$ ,  $M_1M_2X_1X_2X_3$ , and  $M_1M_2M_3X_1X_2X_3$ , where  $M_1$ ,  $M_2$ , and  $M_3$  are each selected from the group consisting of Zn, Cd, Hg, Al, Ga, In, Tl, Pb, Sn, Mg, Ca, Sr, Ba, mixtures and alloys thereof and  $X_1$ ,  $X_2$ , and  $X_3$  are each selected from the group consisting of S, Se, Te, As, Sb, N, P, mixtures and alloys thereof, Si, Ge, Au, Ag, Co, Fe, Ni, Cu, Mn and alloys of Au, Ag, Co, Fe, Ni, Cu, Mn or alloy combinations thereof.